Restricted distribution
Agenda item: 8.3

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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (of UNESCO)

WORLD METEOROLOGICAL ORGANIZATION

Eighteenth Session of the Data Buoy Co-operation Panel
(Trois Ilets, Martinique, France, 14-18 October 2002))

TECHNICAL ISSUES

Argos system and GTS sub-system

(Submitted by CLS, Service Argos)

This document provides information regarding the operations of the Argos system during the last intersessional period. It also reports on future Argos developments such as Argos downlink and Argos-3 higher capabilities. Information is also provided regarding improvements which have been considered and/or implemented within the Argos GTS sub-system during the intersessional period. Other requirements might be proposed for implementation.

The panel will be invited to

(a) Suggest any new user requirement that might be considered for implementation in the future (e.g. quality control procedures for Argo profiling float data), suggest time table for implementation and mechanism for funding;

(b) Decide on any other actions required regarding this issue.

Section 1. REPORT ON 2001-2002 ARGOS OPERATIONS

1. Space segment

1.1 Operational satellites

The two operational satellites are NOAA-16 (L), since March 2001, and NOAA-15 (K), since December 1st, 1998.
NOAA-17 (M) was successfully launched on June 24, 2002. Subject to NOAA confirmation, it should replace NOAA-15 (K) as an operational satellite by the end of September.

1.2 Other satellites

NOAA-17 (M), NOAA-14 (J) and NOAA-12 (D) are used as secondary satellites. Global and Regional datasets they collect are delivered according to the "multi-satellite" service characteristics.
NOAA-11 (H) is providing global datasets which are also delivered through the "multi-satellite" service. NOAA-11 is no longer delivering real-time data through the HRPT downlink since October 2001.

From **Satellite status**	Dec 98	Oct 99	Sep 2000	Mar 01	July 02
Commisioning			NOAA-16		NOAA-17
Operational	 NOAA-15 NOAA-14	 NOAA-15 NOAA-14	 NOAA-15 NOAA-14	 NOAA-16 NOAA-15	 NOAA-16 NOAA-15
Back-up Third satellite	 NOAA-11 NOAA-12 NOAA-10	 NOAA-11 NOAA-12	 NOAA-11 NOAA-12	 NOAA-14 NOAA-11 NOAA-12	 NOAA-14 NOAA-11 NOAA-17 NOAA-12
Decommisioned	NOAA-9	NOAA-9 NOAA-10	NOAA-9 NOAA-10	NOAA-9 NOAA-10	NOAA-9 NOAA-10

2. Ground receiving stations

2.2 Global stations

The situation is essentially the same as last year:

- The two global stations able to acquire the STIP telemetry are still the Fairbanks and Wallops Island stations. The Lannion station is no longer used since the year 2000.

- These two stations deliver the STIP telemetry from the satellites NOAA-11, NOAA-12, NOAA-14, NOAA-15 et NOAA-16 and NOAA-17.

- As regards NOAA-12, only two orbits per day are delivered by NOAA/NESDIS.

- The STIP telemetry from NOAA-11 – the only type of telemetry available for this satellite – is delivered by group of three or four orbits.

Figure 1 shows STIP data set arrival times at the Toulouse and Largo processing centers. Ideally, one data set should be received every 100 minutes.

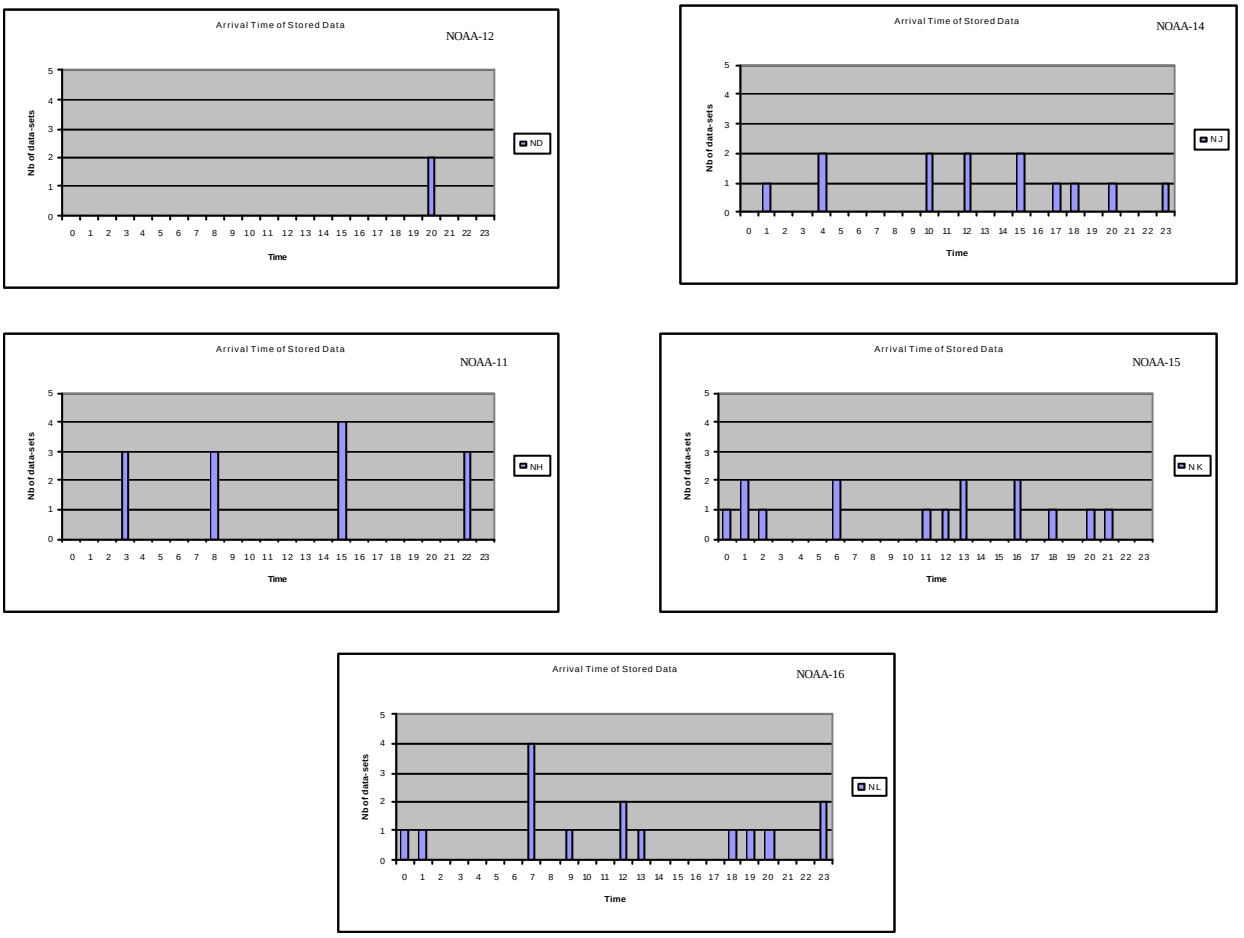


Figure 1

Figure 2 shows the satellite orbit plans in July 2002. In dashed line, the orbit plans of the two future satellites with an Argos instrument on-board, NOAA-17 and ADEOS-II. These satellites are planned to be launched in 2002, respectively in June (successfully launched on June 24th) and November.

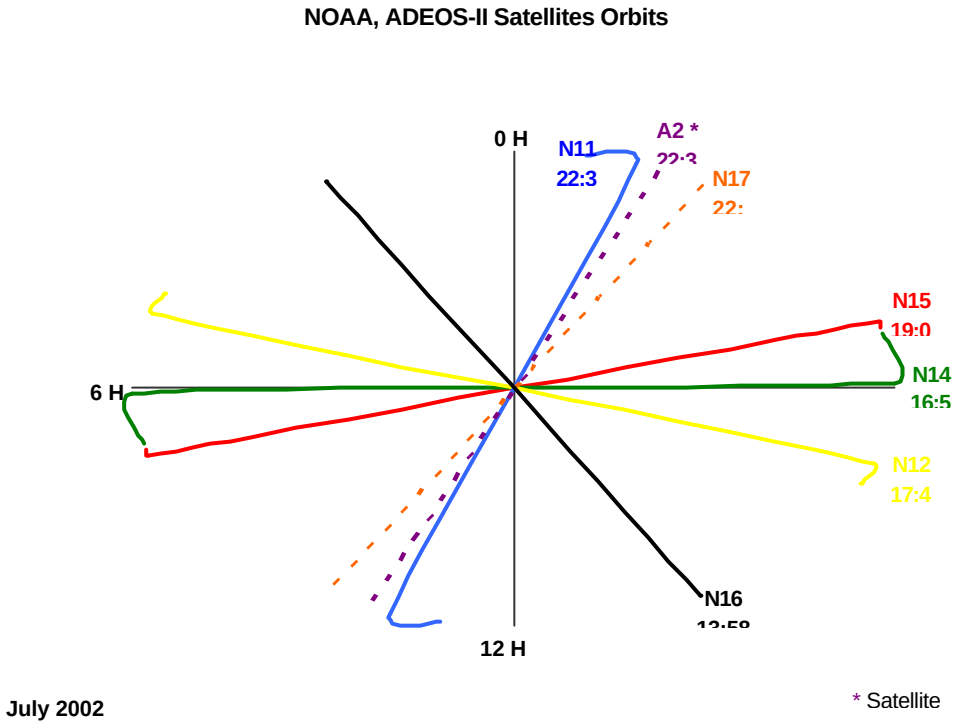


Figure 2

2.3 Regional stations

CLS and Service Argos Inc. pursued their efforts in 2001 to increase the number of receiving stations able to provide TIP data sets from the NOAA satellites. Six new stations joined the Argos network during the year. They are in Buenos Aires (Argentina, INTA), St Denis de la Réunion (Reunion Island, IRD), Noumea (French Caledonia, IRD), Las Palmas (Canaries Island, IRD) and Miami (USA, NOAA/AOML).
In summer 2002, we completed the connection to our network of three new stations of located in Singapore, Oslo and Hatoyama (Japan, NASDA).

There are currently 32 stations delivering TIP data sets to CLS and Service Argos Inc.

These regional stations no longer process data from NOAA-11 since the HRPT channel was shut down on October 17, 2000. However, most of them process data from NOAA-16, NOAA-15, NOAA-14 and NOAA-12, and some from NOAA-17, so we have been able to maintain good throughput times for delivery of results.

List of regional receiving stations

	Antennas	Country	Operator	Possible satellites
1	Buenos Aires	Argentina	INTA	**N12, N14, N15, N16,**
2	Casey	Australia (Antarctica)	BOM	**N12, N14, N15, N16,**
3	Cayenne	France (Guyana)	IRD	**N12, N14, N15, N16,**
4	Darwin	Australia	BOM	**N12, N14, N15, N16,**
5	Gilmore	USA	NOAA/NESDIS	**N12, N14, N15, N16, N17**
6	Halifax	Canada	Can. Coast Guard	**N12, N14, N15, N16, N17**
7	Hatoyama	Japan	NASDA/EOC	**N12, N14, N15, N16,**
8	Hawaï	USA	NOAA/NWS	**N12, N14, , ,**
9	Ile de la Réunion	France (Reunion Island)	Météo France	**, N14, , N16,**
10	Ile de la Réunion	France (Reunion Island)	IRD	**N12, N14, N15, N16,**
11	Lannion	France	Météo France	**, N14, N15, N16,**
12	Las Palmas	Canaries Island	Univ. Las Palmas	**N12, N14, N15, N16**
13	Melbourne	Australia	BOM	**N12, N14, N15, N16,**
14	Miami	USA	NOAA/AOML	**N12, N14, N15, N16, N17**
15	Noumea	France (New Caledonia)	IRD	**N12, N14, , N16,**
16	Oslo	Norway	NMI	**N12, N14, N15, N16,**
17	Perth	Australia	BOM	**N12, N14, N15, N16,**
18	Singapore	Singapore	SMM	**N12, N14, N15, N16,**
19	Wallops	USA	NOAA/NESDIS	**N12, N14, N15, N16, N17**
20	Wellington	New-Zeland	Met Office	**, , N15, N16,**
21	Aussaguel	France	CLS	**N12, N14, N15, N16, N17**
22	Cape Town	South Africa	CLS/SAWB	**N12, N14, N15, N16, N17**
23	Helsinki	Finland	CLS	**N12, N14, N15, N16, N17**
24	Largo	USA	SAI	**N12, N14, N15, N16, N17**
25	Las Palmas	Canaries Island	CLS	**N12, N14, N15, N16, N17**
26	Lima	Peru	CLS perù	**N12, N14, N15, N16, N17**
27	Toulouse	France	CLS	**N12, N14, N15, N16, N17**
28	Murmansk	Russia	Complex System	**N12, N14, N15, N16,**
29	Petropavlosk	Russia	Rybradiov	**N12, N14, N15, N16,**
30	Tokyo	Japan	Jamstec	**N12, N14, N15, N16,**
31	Edmonton	Canada	Envir. Canada	**N12, N14, , N16, N17**
32	Monterey	USA	NESDIS/NWS	**N12, , , N16,**

Table 2

ARGOS receiving station network

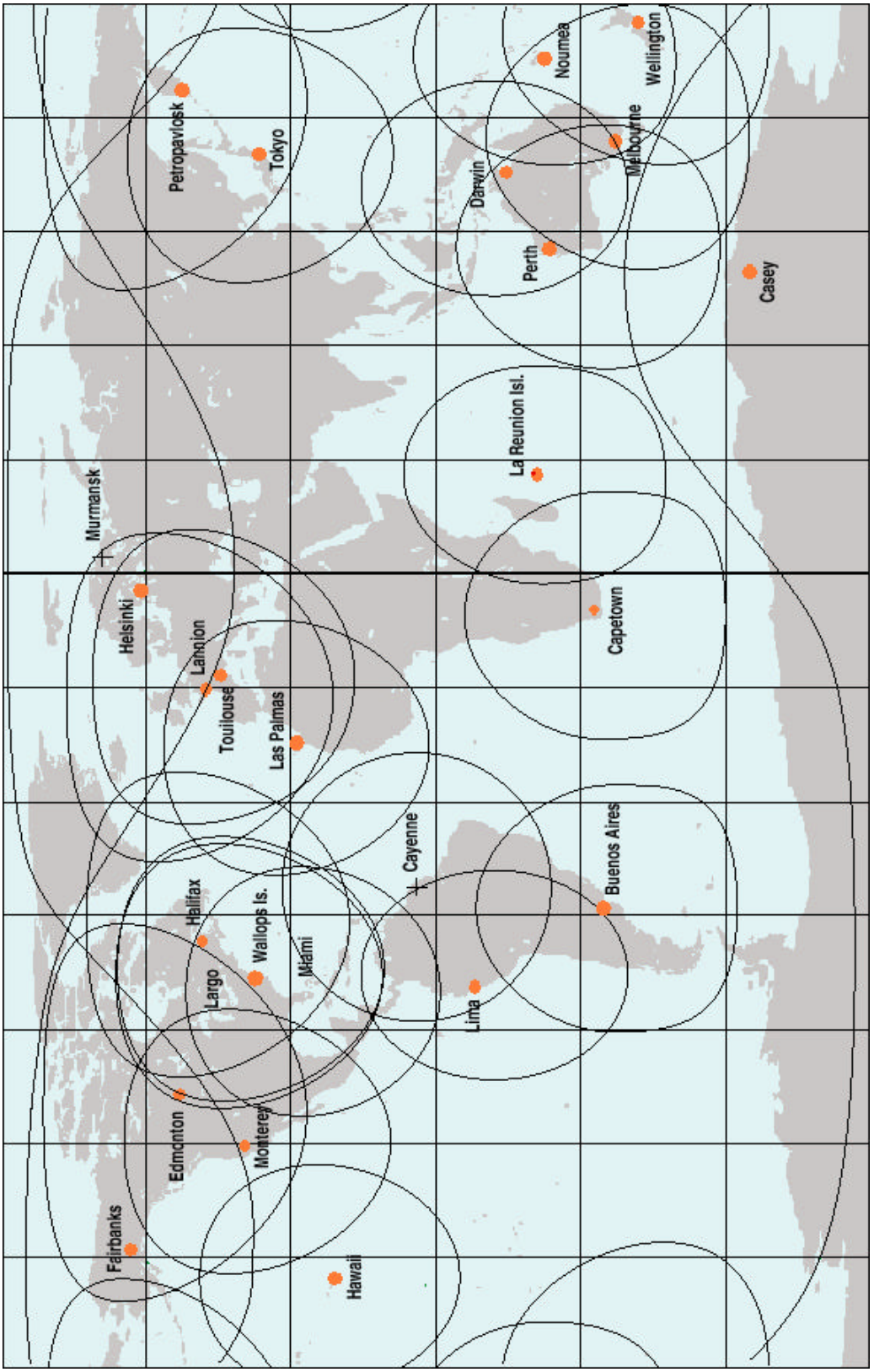


Figure 3

Receiving Station Performance

	NOAA12	NOAA14	NOAA15	NOAA16	NOAA17
Aussaguel	0.74	0.78	0.71	0.85	0.5
Buenos Aires	0.43	0.46	0.21	0.23	0.11
Cape Town	0.78	0.84	0.71	0.89	0.48
Casey	0.6	0.45	0.26	0.86	
Cayenne	0.77	0.76	0.63	0.73	0.31
Darwin	0.7	0.66	1	1	
Edmonton	0.99	1	0.5		
Gilmore	0	0.57	0.7	0.7	0.43
Halifax	0.61	0.34	0.62	0.33	0.28
Hatoyama	0.39	0.39	0.35	0.43	
Hawai	0.57	0.57	0.58	0.73	
Helsinki	0,76	0,82	0,64	0,85	0,51
Ile de la Réunion	1	1			
Ile de la Réunion (IRD)					
Lannion	0.96	0.68	0.98		
Largo	0.55	0.59	0.61	0.61	0.32
Las Palmas CLS	0.59	0.69	0.47	0.73	0.38
Las Palmas IRD	0.08	0.08	0.06	0.09	
Lima	0.93	0.97	0.87	0.95	0.53
Melbourne	0.32	0.66	0.7	0.76	
Miami	0.61	0.75	0.69	0.34	
Monterey	0.25	0.81			
Murmansk	0.34	0.3	0.28	0.44	
Noumea	0.61	0.64	0.74		
Oslo	0.34	0.44	0.39	0.54	0.01
Perth	0.84	0.57	0.71	0.93	
Petropavlsok					
Singapore	0.57	0.53	0.57	0.63	
Tokyo	0.59	0.52	0.39	0.6	
Toulouse	0.79	0.87	0.73	0.96	0.53
Wallops	0.15	0.66	0.65	0.75	0.39
Wellington	0.59	0.73	0.32	0.73	

Table 3 bis

3. Processing centers

Each of the five Argos processing centers—in Toulouse, Largo, Melbourne, Tokyo, and Lima—operated without a major hitch in 2001.

The two global processing centers in Toulouse and Largo continue to process data sets from all receiving stations, handling over 400 data sets per day (see Figure 4). The regional processing centers in Melbourne, Tokyo, and Lima only process data sets from stations covering their region. Supplementary data providing global coverage are supplied by the Toulouse center or by the Largos center if necessary.

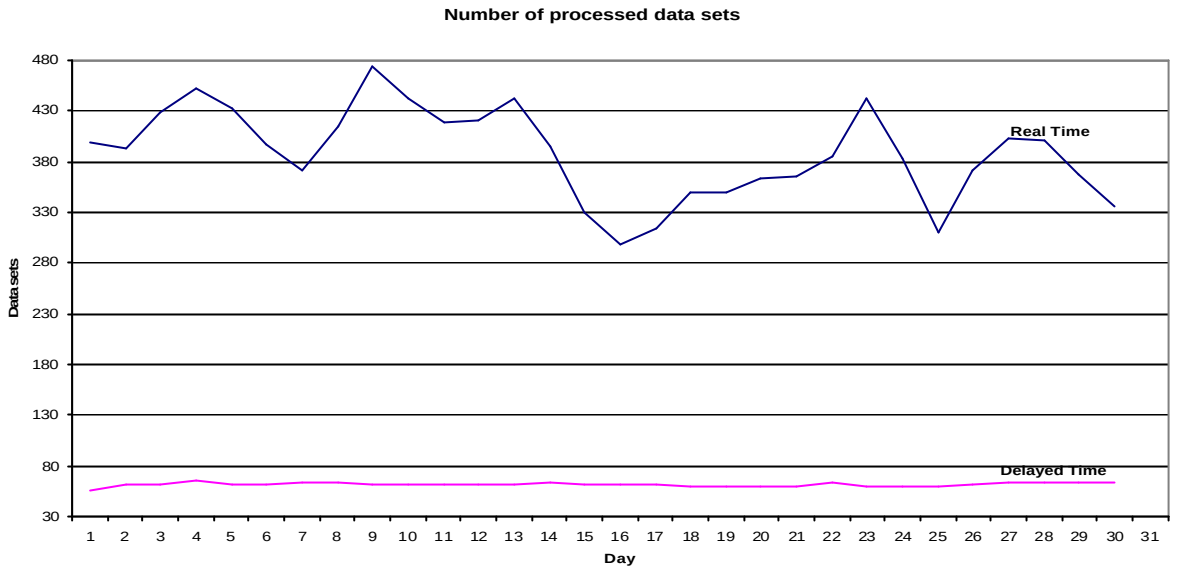


Figure 4

The number of Argos platforms operating continues to increase. In December 2001, about 4700 platforms were seen on average per day (figure 5). However, each of the two global centers processed data from 8000 individual platforms during this month.

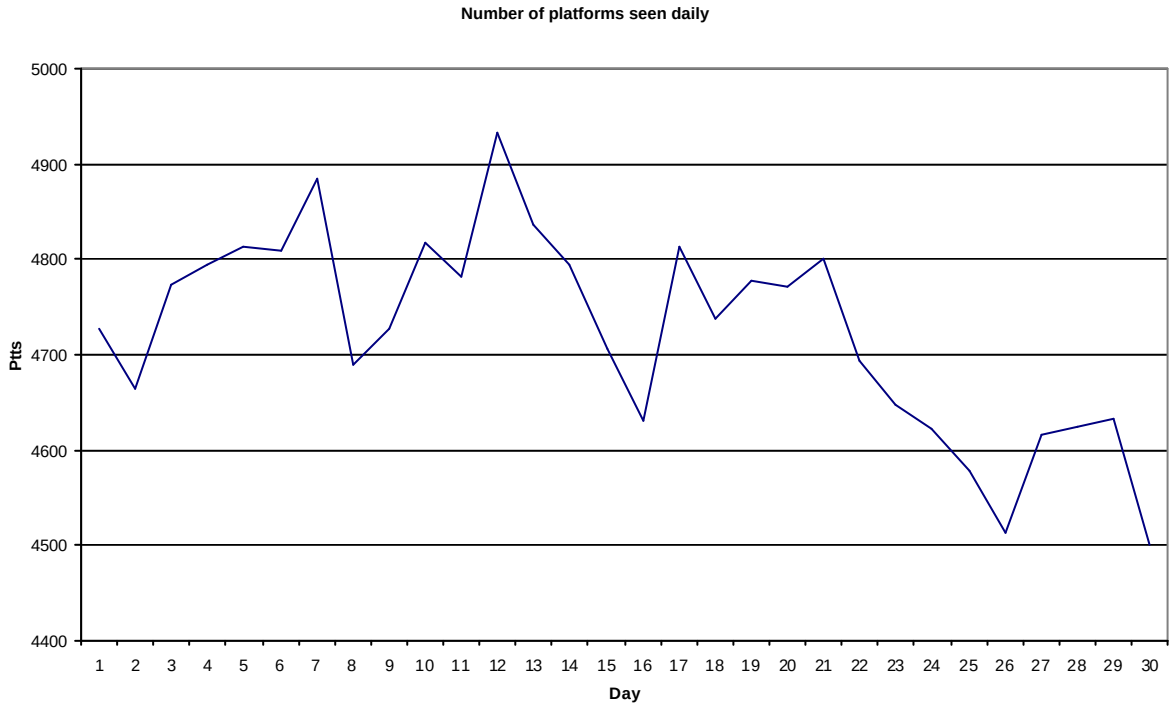


Figure 5

Figures 6 and 7 below show the number of locations and messages computed every day by the Largo and Toulouse centers.

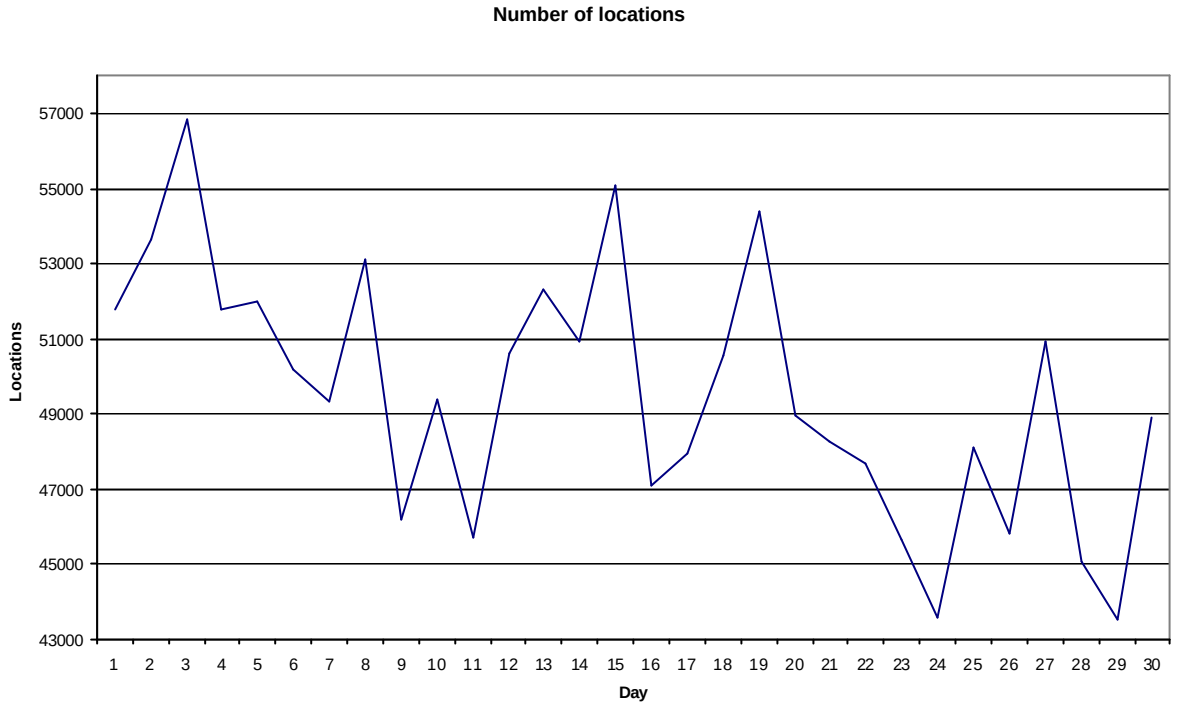


Figure 6

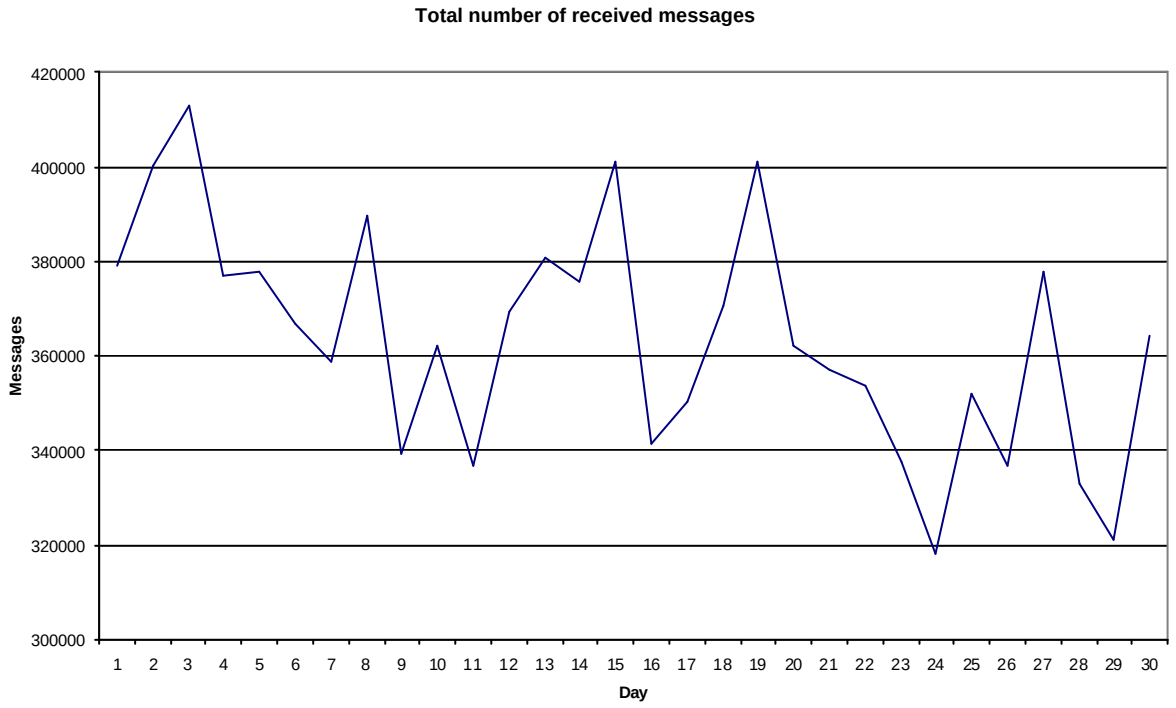


Figure 7

4. Communication links

The Internet is the main communication link used to distribute processed data to users and to retrieve data sets from receiving stations. The Internet access of each global center has been upgraded from 512 kbps to 1 Mbits.

The X25 protocol has been stopped at Service Argos Inc but continues to be used by the Toulouse center to

send weather bulletins to the Météo France weather service. We planned to migrate to FTP protocol during the year 2002. Anyway, some other users, for security reasons, still prefer to receive their data using this communications protocol via our Automatic Distribution Service (ADS).

As we announced last year, the transatlantic link between Toulouse and Largo has been definitively stopped on July 2001.

5. Throughput time for delivery results

CLS throughput times for delivery of results should be calculated in terms of the time taken to reach end users.
For each message received by the satellite, we compute the data turnaround time/data availability which is the time elapsed between the recording of the message on board the satellite and processing of the same message by the global processing center.

Table 8 shows the throughput time for delivery of results for stored data from NOAA-16 and NOAA-15, the two operational satellites.
33% of the data are available within two hours while 64% of the data are available within three hours. This is quite the same situation as last year.

Satellite Delivery	NOAA-15 & NOAA-16
1 h	15 %
2 h	33 %
3 h	64 %
4 h	85 %
5 h	92 %
> 5 h	100 %

Table 8: Stored data availability for satellites NOAA-15 and NOAA-16

Table 9 shows the throughput time for delivery of results for stored data from NOAA-11 and NOAA-14, the two backup satellites (we do not receive any more stored data from NOAA-12).

Satellite Delivery	NOAA-11 & NOAA-14
1 h	01 %
2 h	11 %
3 h	30 %
4 h	53 %
5 h	70 %
> 5 h	100 %

Table 9: Stored data availability for satellites NOAA-11 and NOAA-14

Only 30% of the data are available within three hours as opposed to 64% for the two operational satellites. This delay is due to the NOAA data set delivery times.

Table 10 below shows the throughput time for delivery of results for real-time data from NOAA-16, NOAA-15, NOAA-14 and NOAA-12 and acquired by the 28 HRPT receiving stations.

The throughput time for delivery of results for real-time data includes three main delays:

- the satellite pass duration, because we have to wait for the end of the pass to transfer and process the data set;
- the time taken to transfer the data set to the global processing centers. Most transfers go over the Internet. The transfer rate is getting better and better.
- the time taken to process the data set by the global processing centers, which is not significant (less than 30 seconds).

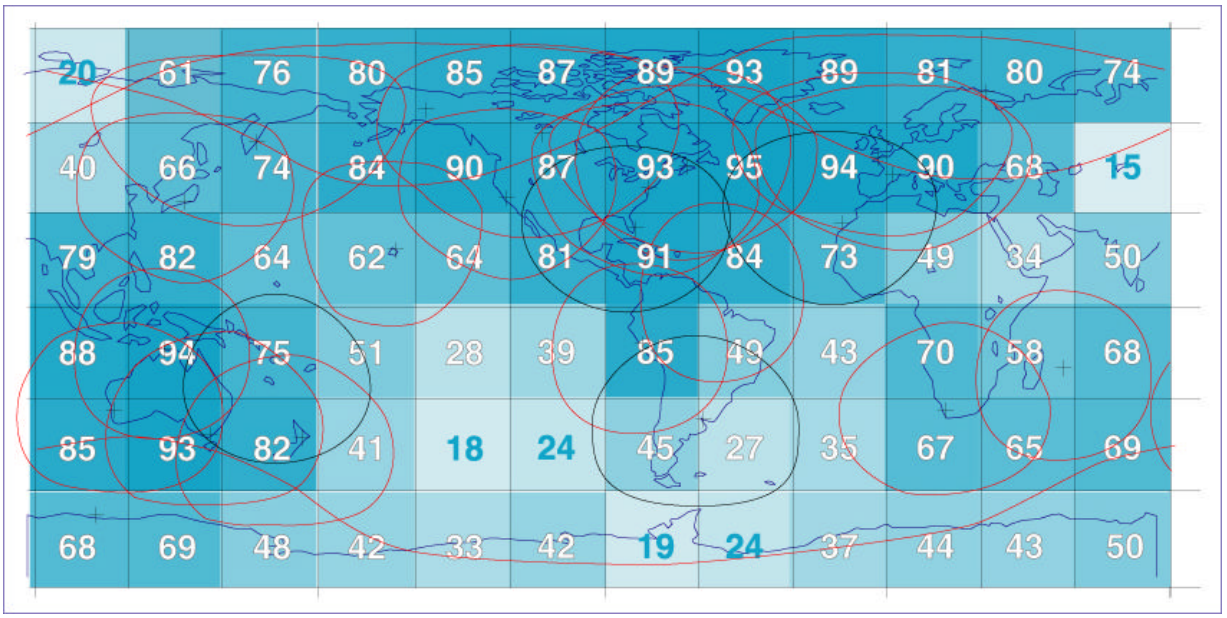
Satellite **Delivery**	**NOAA-12, NOAA-14 NOAA-15 & NOAA-16**
10’	5 %
15’	20 %
20’	47 %
30’	86 %
45’	97 %
60’	99 %
>60’	100 %

Table 10: Real-time data availability

86 % of these real-time data are available within 30 minutes.

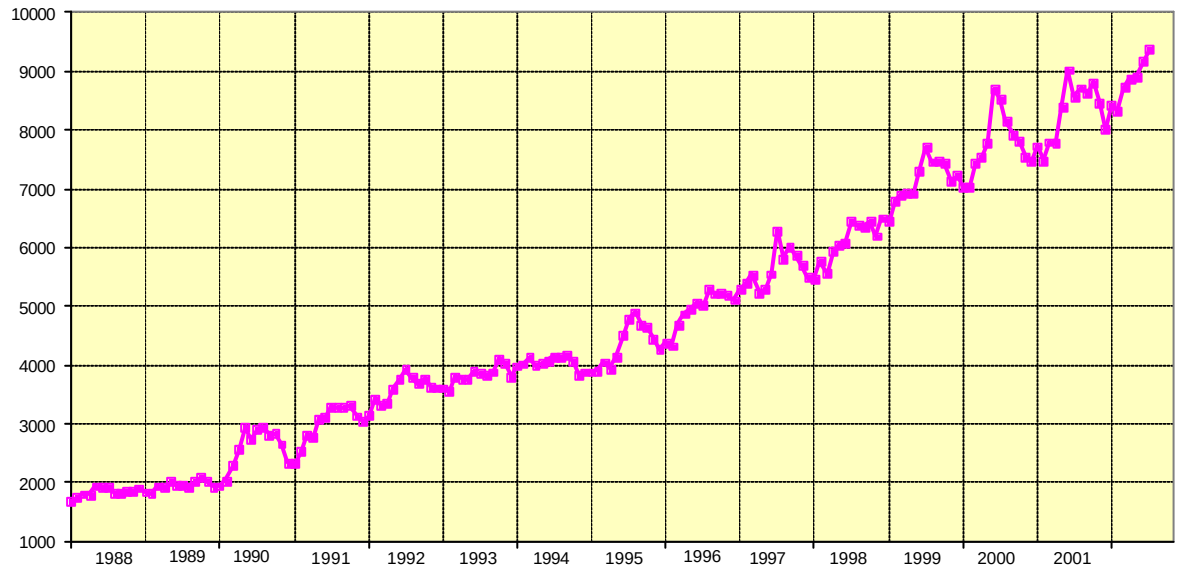
Note that about 2/3 of the Argos data are now available in near real time.

Percentage of real-time data received in each geographical square (July 2002)



2002

Evolution of Active Platforms



Active platform evolution since 1988

An active platform is a platform received at least once in the month

Section 2. SYSTEM IMPROVEMENTS

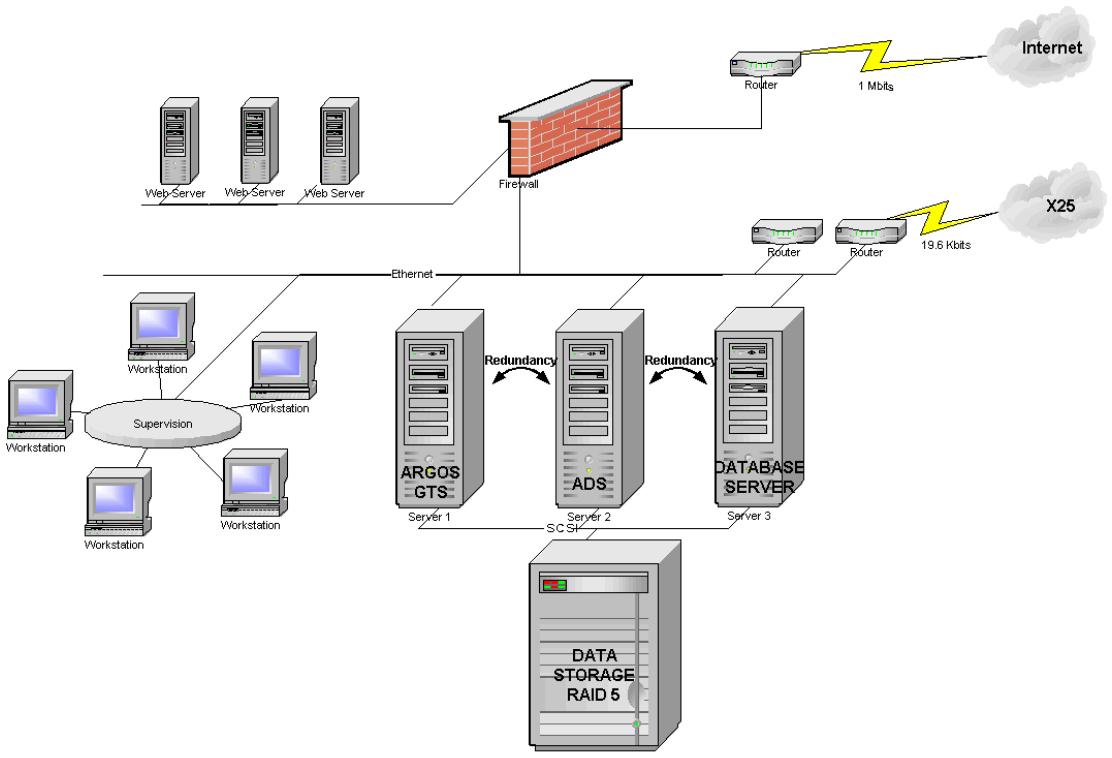
1. Hardware and software configuration

1.1 Hardware Configuration

In 2001, we continued to implement the Argos 2001 elements in our computer systems architecture. It mainly consisted in :

- upgrading two of the three Argos operational computers,
- implementing an Oracle database management system,
- implementing a data replication mechanism between the both global centers in order to maintain the coherency and allow the redundancy of the global centers,
- integrating a Web data distribution center
- implementing an Argos 2001 validation configuration

Our computer systems architecture is the following one :

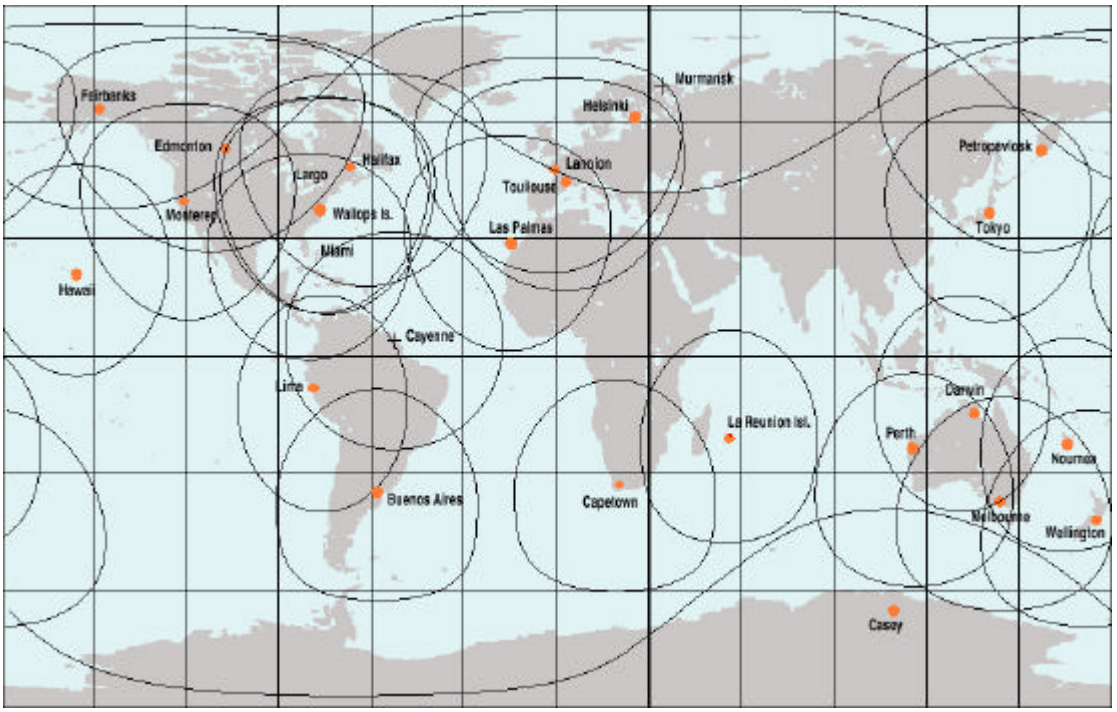


Another key investment in 2001 was the implementation of a Web server dedicated to the ARGO project.

1.2 Ground Segment Architecture

Six new HRPT stations joined our network in 2001, thus helping to improve data throughput times to users. They are in Buenos Aires (Argentina), Miami (USA), Las Palmas (Canaries Island), Noumea (French Caledonia), St Denis de la Reunion (Reunion Island) and Helsinki (Finland).
In summer 2002, we completed the connection to our network of three new stations of located in Singapore, Oslo and Hatoyama (Japan, NASDA).

The Argos stations network has now 32 antennas.



1.3 Software configuration

CLS is focusing most of its software development efforts on the Argos 2001 and Argos/Next projects – see §2. PROJECTS. A team keeps working on corrective software maintenance and upgrades that are vital to continue meeting user requirements.

1.4 Regional processing centers

The three regional processing centers—in Melbourne, Tokyo, and Lima—operated without a major hitch in 2001.
The main work at these centers involved upgrading versions of basic software.

2. Projects

2.1 Argos 2001

The purpose of the Argos 2001 project is to upgrade the entire Argos processing system. This ambitious project is vital for the long-term continuity of the Argos system and to better serve users. This project is scheduled in three phases :

Phase I : Development and implementation of a new user interface allowing users to access data and view and update technical files via a web server. The System Use Agreement database will also be implemented during this phase. Data will be stored and managed by a database management system designed to be responsive to users' needs. Our objective is to give users more versatility if they require it. Consequently we will be expected to offer them quick and efficient support.

Phase II : Improvement and development of value-added services.
Phase III : Redesign of the Argos processing system.

Current Status :
Phase I began at the end of 1998 and is being finalized
The user management application is operational
The User Office application has been operational since the end of 2000

Performance problems have been detected in the new data distribution system, and the opening of the website to users has consequently been postponed until these have been resolved. A technical solution has already been found and is in the process of being implemented. The first internal tests are scheduled to take place in early June. The distribution system is due to be operational by the end of the year.

Phase II requirement specifications were reviewed and approved in January. Software specifications are being written, and Argos 2001 Phase II development will commence at the beginning of 2003 and will last about 14 months.

2.2 Argos Next

The downlink messaging capabilities provided by the ADEOS II/Argos DCS equipment has required the addition of two new components to the current Argos ground segment:

2.2.1 Downlink Message Management Center (DMMC)

This center is located at CLS premises in Toulouse, France.
The DMMC's role is to centralize, validate, and schedule downlink message requests from users before transmitting downlink messages to the satellite (via a Master Beacon).

DMMC development was completed by the end of the second quarter of 2000. DMMC Acceptance tests took place during the third quarter of 2000.
The DMMC will be installed onto the Argos operational configuration (Toulouse APC) during summer 2002.

Note : a symmetrical DMMC will be installed at SAI Largo - USA (after ARGOS 2001 phase I development is completed).

The Argos/Next Web server developed within the scope of the Argos 2001 project will allow users to:

- enter requests and compile downlink messages for platforms carrying an Argos Next/Argos 3 receiver;

- consult request status until completion.

The Argos Web server - Argos-Next part development is completed. It is a preliminary version (beta test version) used to fully validate the interface with the DMMC, finalize the screen design and texts. Operational version is planned for October 2002.

2.2.2 Master Beacon network

A network of four master beacons located at strategic points around the globe, acting as the link between satellites and the DMMC.

The four locations foreseen for these beacons are:
Toulouse, Hatoyama, Fairbanks, and Spitsberg (TBC).

Today, Toulouse, Hatoyama and Fairbanks master beacons are installed. The last one (Fairbanks) was installed, last year, beginning of October.

No more installation is foreseen before the ADEOS-II launch.

This project is also managing the current Argos software upgrade to support:

- file exchanges with the ADEOS II ground segment;
- ADEOS II spacecraft maneuvers;
- ADEOS II/Argos DCS Level-0 data and HK telemetry processing;
- processing of Argos messages related to the downlink messaging service;
- 28-bit ID numbers.

All these modifications have now been completed and validated (except ADEOS II spacecraft maneuvers software).

Fully detailed interface tests between NASDA/ADEOS II ground segment and CLS/APC were conducted since mid-2000. The goal of these tests is to confirm both mission data and mission operation interface compatibility between NASDA/ground segment and CLS/APC.

The launch of ADEOS-II, is now scheduled for November 2002 (tentative date).

2.2.3 DAN development (ARGOS-NEXT demonstrator)

September 2001, started a new development of which the objective is to fully simulate the ARGOS-NEXT system. The DAN will implement all the components of the ARGOS-NEXT system : user WEB interface, DMMC, APC, master beacon and PMTs to simulate the ground segment and the ARGOS-NEXT instrument mock-up located in the CNES laboratory to simulate the space segment.

Three missions were allocated to the DAN :

- preparation of the end-to-end tests with the ARGOS-NEXT equipment on board ADEOS-II to qualify the instrument during the in-flight acceptance test phase.
- Demonstration of the downlink capabilities and ARGOS-NEXT services to potential users
- Argos people and client training.

The DAN will be operational by the end of summer 2002.

2.2.4 User PMT development

PMT or Platform Messaging Transceiver is an upgrade of the PTT (Platform Transmitter Terminal) designed to support downlink messaging. It comprises :

- A transmitter certified by CNES,
- A receiver designed and built by CNES and industry partners,
- A transmit/receive antenna,
- A logic unit that allows these elements to dialog with external systems and manages the downlink messaging.

To promote the downlink messaging among the user community, CLS has started, with industry partners, the development of a first set of PMTs. PMTs will be available for Argos applications in early 2003

3. Frequency spreading

Report from the 36th Argos Operations Committee Meeting, June 2002.

M. Cazenave of CLS reviewed the five year evolution of the use of the Argos-1 and Argos-2 bandwidth. It was noted that over 60% of users are clustered in the center of the frequency band. CLS/SAI have begun promotional activities to educate users and ask manufacturers to voluntarily utilize all of the available bandwidth. Progress has been made but it may be necessary in the future to formally organize the use of the bandwidth with mandatory frequency assignments. The OPSCOM recognized the need for more stringent framework to encourage ARGOS beacon manufacturers to utilize the entire Argos frequency band. An Action item was open to address the issue of assigning frequencies in the SUA application process: "CLS will propose a procedure to assign frequencies for Argos applications".

4. Data Buoy Cooperation Panel requirements

Action 1. GTS subsystem to relay data from other sources.

The meeting agreed in principle with the proposal. It recommended that the feasibility study, to be undertaken by the DBCP Technical Coordinator and CLS, should be completed in time for presentation to the next OpsCom session.

During the intersessional period no requirement nor need was expressed by the community, as a consequence CLS/SAI, in agreement with the DBCP Technical Coordinator, decided to postpone this feasibility study. Instead, a study and proposal was made to allow the transmission onto GTS of observations already coded in WMO formats that would be ftp to CLS or SAI by the buoy operator.

Action 2. Brazilian satellite and Argos.

The meeting recognized that there are currently two Brazilian satellites in equatorial orbits (and one in a polar orbit), and that connecting Argos to these satellites could potentially greatly enhance equatorial coverage and data return, although implementing such a connection would be a complex process. The meeting recommended that a concrete proposal for such connection, including a cost-benefit analysis, should be prepared by CLS, to be put before the OpsCom session in May 2002 to seek an in-principle agreement, with a report on the matter to be made to JTA XXII.

Report from the 36th Argos Operations Committee Meeting, June 2002

W. Yamaguti of INPE reported that the Brazilian DCS is operational on three satellites including SCD-1, SCD-2 and CBERS-1 (see exhibit #15). Five more satellites are planned in the future : CBERS-2 (2002), SSR-1 (2005), CBERS-3 (2005), SCD-3 (2007) and CBERS-4 (2007). In summary, there are presently approximately 470 operational Data Collection Platforms (DCPs) and data are collected and transmitted to two satellite receiving stations located in Cuiaba and Alcantara. DCP message processing is done at Data Collection Mission center located in Cachoeira Paulista and users have access to their data via the Internet (FTP) approximately 30 minutes after each satellite pass.

C. Vassal of CLS reported on data exchange tests that have taken place between CLS and INPE since July 2001 (see exhibit #16). Based upon test results, it has been determined that the processing and distribution of Brazilian DCS data is feasible through the Argos processing centers. Results indicated that the use of the Brazilian DCS significantly improved the timeliness associated with the delivery of data from PTTs operating within the coverage of the Cuiaba station. It was also observed that the availability of data from this station eliminated mid-day data acquisition "holes" that often occur at low latitudes in the Southern hemisphere. It was noted that nearly 40% more data was delivered through the addition of the Brazilian DCS to the overall Argos system. CLS's principal Latin American customers are reported to be more satisfied with system performance and "near real-time" data delivery.

It is proposed that the next step for improved technical cooperation between CNES/CLS and INPE would be the development and implementation of a dedicated stand-alone Brazilian DCS station with an enhanced S-Band receiving antenna and processor. A cost and performance evaluation for this station concept is expected to be complete by December 2002.

In view of the above results, the Operations Committee recommends that CNES/CLS and INPE establish a framework for this cooperation through an formal agreement. Two action items (36-5-C/I and 36-6-C/I) were opened to formalize the current data sharing experiment and expand the cooperative efforts.

Action 3. To complete the connections of LUT's to Argos Processing Centers in support of ISABP.

South African LUT's on Gough and Marion Islands

At present the communications on Gough and Marion Island is via V-sat to a land station near Pretoria. A landline is used from the land station to the SA Department of Foreign Affairs switchboard and from there via X-25 to the South African Weather Service. E-mail facility from the Islands are limited to 12 hours per day from 06:00 to 18:00. As backup, there is an Inmarsat C link to Pretoria, which is very costly.
In addition, there is limited capacity on the landlines as it is shared by various organizations including Foreign Affairs missions abroad.
Because of these limitations, the SAWS is now investigating with their telecom provider the possibility to set a 96k bandwith from the Islands and a Diginet line from the land station to the Weather Service with 24 hour internet service. A quote from the provider, should be available soon.

Falklands LUT

For at least 5 or 6 years we have been attempting to establish an operational link with the UK Met Office (UKMO) LUT in the Falklands/Malvinas Islands off the coast of Argentina to enable the transfer of real-time Argos data collected by that antenna. This process has been quite difficult because the location is very remote and it has been nearly impossible to identify the correct knowledgeable person in the UKMO to assist us.

Despite encouraging signs about a year ago we reluctantly came to the conclusion early this year that it is not economically feasible to establish a sufficiently robust communication link to that site. The only feasible option for a reliable link is a dedicated communication line. The cost for such a line would be extremely expensive however, and based on information provided by UKMO even if such a line were to be implemented he "remains concerned that the system would still be poorly supported particularly with regard to the software and this is undesirable in any operational system let alone one as remote as this." Attempts to share the cost of the line with UK agencies were unsuccessful. With respect to cost-sharing, UKMO representative specifically indicated that,

"I have discussed the possibility of some cost sharing on a permanent internet connection in the Falklands with our defence area. However, they are content with their present service and more importantly, there is no financial advantage to the change compared with their present agreement. In fact they would lose money on the change. Under the circumstances, I cannot offer financial assistance, although we would be willing to help with any

arrangements, and will continue to look after the LUT of course."

And, specifically with regard to the interests of the UKMO, he said,

"Providing the data in this way has some benefit to us as we will also receive data in a more timely fashion. However, that benefit is somewhat limited."

Bottom line: The communications cost would be too high and our confidence would be very low that the LUT system would operate sufficiently reliably for our needs. Thanks to all of our colleague who have assisted in the effort to try to make this happen during the last several years, especially the U.S. Naval Oceanographic Office.

Action 4. Connection of Oslo LUT

Olso LUT is now connected to the Argos System. Data collected in real-time in Oslo are therefore processed through the standard Argos system, including for location, and GTS distribution purposes. These data distributed on GTS are therefore consistent with the Argos data collected for the same buoys through other Argos receiving stations (local or global).

Action 5. Specific developments within the Argos GTS sub-system

The following developments have been conducted during the intersessional period with regard to the GTS sub-system:

a) **BUFR code**. Developments for the BUFR code started in January 2002. Argos GTS sub-system will be upgraded to permit encoding and GTS distribution of the buoy data in BUFR. Distribution in BUOY format will continue in parallel. Developments should be achieved by January 2003. However, after operational implementation by Service Argos, in order to correct un-noticed encoding problems, series of tests will be conducted in cooperation with a few operational centres. Operational distribution of BUFR reports is therefore expected to begin in mid 2003.

b) **BUOY code**. The new version of the BUOY code (FM-18-XII) was finally implemented at Service Argos on 27 March 2002 (new version was implemented by CBS on 7 November 2001).

c) **Météo France GTS link**. GTS buoy data are now delivered to Météo France for global GTS distribution via tcp/ip (instead of X25 dedicated link).

d) **TIP**. New algorithm was implemented in February 2002 for the computation of wind direction data for TAO moorings.

e) **Argo QC**. Based on the QC specifications from the Argo Data Management Team, a specification document was written for the implementation of the new QC in the Argos GTS subsystem. The intention is to build an independent dedicated module, interfaced with the current GTS subsystem main software to gather all QC specific to profile data (XBTs, TAO, floats…). Quotations are expected for early September.

Note that Argos GTS sub-system reference guide was updated to reflect implemented improvements. The new guide was published by the DBCP (Revision 1) and can be obtained from the Technical Coordinator of the DBCP. It is also available on-line at http://www.dbcp.noaa.gov/dbcp/Argos-GTS-sub-system-ref-guide.pdf.

Action 6. ARGO QC module.

The meeting agreed in principle with the proposal, recognizing that it could be implemented only when details of the procedures were made available to CLS/Argos. It considered that, ideally, the module should be implemented prior to JTA-XXII.

ARGO QC in US Argos Center

Service Argos, Inc. (SAI) and NOAA's Atlantic Oceanographic & Meteorological Laboratory (AOML) of Miami, Florida have teamed up to strengthen the real-time operational processing of the U.S. Argo float data. AOML scientists have successfully developed software modules capable of real-time QC and processing of float profiles relayed via Argos in eleven different data formats and coding of the data into GTS format. This software has been implemented by AOML at Service Argos and augments the existing 24/7 Argos GTS data processing and dissemination chain. By taking advantage of the on-line operational systems at Argos, this AOML-SAI partnership maximizes the real-time processing and dissemination capabilities for the U.S. Argo Program.

As a consequence, all US ARGO profiles inserted on the GTS benefit from the AOML quality controls which meet the ARGO requirements.

ARGO QC in the French Argos Center: See Action 5 above.